

REMARKS

The Official Action mailed July 15, 2005, has been received and its contents carefully noted. Filed concurrently herewith is a *Request for One Month Extension of Time*, which extends the shortened statutory period for response to November 15, 2005. Accordingly, the Applicants respectfully submit that this response is being timely filed.

The Applicants appreciate Primary Examiner Deo's and Supervisory Examiner Norton's time in conducting a personal interview on October 19, 2005. As described in more detail below, during the interview the Applicants stressed that the prior art of record does not teach or suggest using fluorine containing etching gas. The Examiner agreed to consider the Applicants' remarks following the submission of this *Amendment*.

The Applicants note with appreciation the consideration of the Information Disclosure Statements filed on March 19, 2002, July 15, 2004, December 20, 2004, and May 9, 2005.

Claims 7-14, 21-29 and 37-47 were pending in the present application prior to the above amendment, of which claims 7-10, 21-25 and 37-40 are independent. The Applicants note with appreciation the allowance of claims 7-14, 21, 22, 24, 25 and 37-46 (Office Action Summary and page 3, Paper No. 071405). Independent claim 23 has been amended to better recite the features of the present invention, and new claims 48-55 have been added to recite additional protection to which the Applicants are entitled. Accordingly, claims 7-14, 21-29 and 37-55 are now pending in the present application, of which claims 7-10, 21-25, 37-40, 48 and 53 are independent. For the reasons set forth in detail below, all claims are believed to be in condition for allowance. Favorable reconsideration is requested.

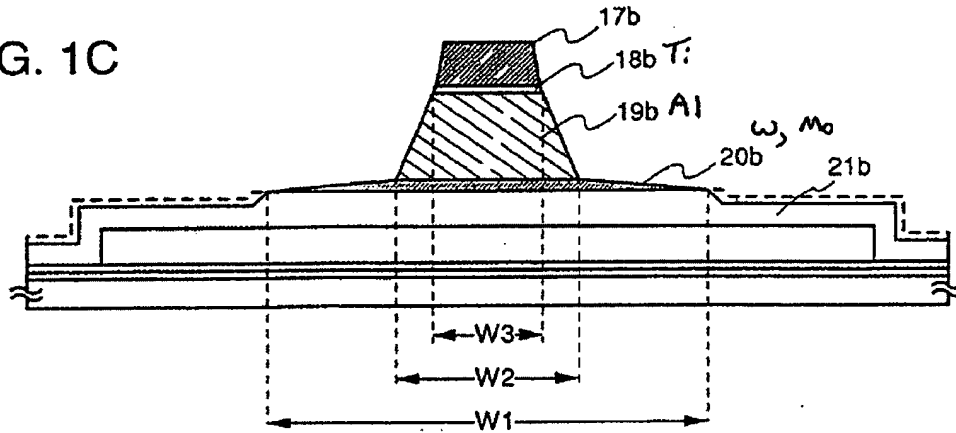
Paragraph 2 of the Official Action rejects independent claim 23 and dependent claims 27, 29 and 47 as obvious based on the combination of U.S. Patent No. 6,440,865 to Lee and Wolf et al., *Silicon Processing for the VLSI Era, Volume 1 – Process Technology*, page 518. Paragraph 3 of the Official Action rejects dependent claims 26 and 28 as obvious based on the combination of Lee, Wolf and U.S. Patent

No. 5,912,506 to Colgan et al. The Applicants respectfully submit that a *prima facie* case of obviousness cannot be maintained against the independent claims of the present application, as amended.

As stated in MPEP §§ 2142-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims, as amended. Independent claim 23 has been amended to recite patterning first, second and third conductive layers by dry etching method to form a conductive layer with a taper portion, where fluorine containing gas is used as etching gas for etching at least the first conductive layer. For the reasons provided below, Lee, Wolf and Colgan, either alone or in combination, do not teach or suggest the above-referenced features of the present invention.

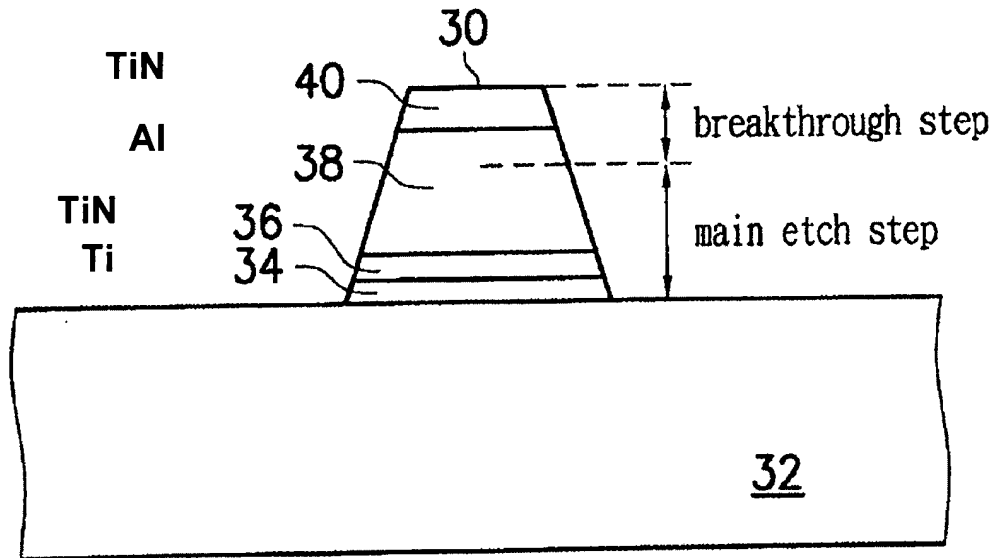
FIG. 1C



The claimed three layer structure (Figure 1C, annotated and reproduced above) results in a low resistance wiring (Al) that resists formation of hillocks and projections (outer layers) and acts as an etch stopper (first layer). Thus, better device performance is realized from this combination.

None of Lee, Wolf, or Colgan discloses or suggests the use of fluorine containing etching gas. In the present invention, fluorine etching gas, such as CF_4 , is used to etch tungsten (W) (see, e.g. page 17 of the present specification). For example, etching occurs without leaving a residue on a gate insulating film; therefore, damage to the gate insulating film is reduced.

Lee does not disclose or suggest the use of fluorine containing etching gas. Also, Lee does not disclose the use of tungsten (W). Therefore, there is no reason to use fluorine containing etching gas in Lee.



Furthermore, in Lee, aluminum must be etched in both etching steps. As shown in Figure 4, for example (annotated and reproduced above), aluminum-alloy layer 38 is etched in a breakthrough step and again in a main etch step. Fluorine containing etching gas is not effective to etch aluminum. Therefore, the use of fluorine containing etching gas for either step of Lee would not be effective and would destroy the function of Lee. As such, Lee does not teach or suggest patterning first, second and third conductive layers by dry etching method to form a conductive layer with a taper portion, where fluorine containing gas is used as etching gas for etching at least the first conductive layer.

Wolf and Colgan do not cure the deficiencies in Lee. The Official Action relies on Wolf to allegedly teach subjecting a resist and a conductive layer to an oxygen plasma (page 2, Paper No. 071405) and on Colgan to allegedly teach that "the first conductive layer comprises of W or Mo and the third conductive layer comprises of Ti" (page 3, *Id.*). However, Lee, Wolf and Colgan do not teach or suggest patterning first, second and third conductive layers by dry etching method to form a conductive layer with a taper

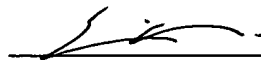
portion, where fluorine containing gas is used as etching gas for etching at least the first conductive layer.

Since Lee, Wolf and Colgan do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

New claims 48-55 have been added to recite additional protection to which the Applicants are entitled. New independent claim 48 is similar to amended claim 23, but is directed to a method of manufacturing a semiconductor device. New independent claim 53 recites a method of manufacturing a semiconductor device that includes forming a first layer of tungsten or molybdenum, forming a second layer including aluminum as a main component, forming a third layer including titanium, patterning by dry etching to form a layer with a taper portion using a fluorine containing etching gas, and a plasma treatment. For the reasons stated above and already of record, the Applicants respectfully submit that new claims 48-55 are in condition for allowance.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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